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GEOGRAPHIC SUPPORT PROJECT

WEST CHINA

RELATIVE RELIABILITY FOR GENERAL LOCATIONAL PURPOSES  
OF TERRAIN INFORMATION ON SELECTED MAP SHEETS AT 1:1,000,000 SCALE

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W A R N I N G

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CENTRAL INTELLIGENCE AGENCY

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## Figure 1

West China: Comparison of Selected ~~TM~~  
 Sheets (AMS 1301 Series) . . . . . Following Page 3

## Map Overlay

West China: Relative Reliability for General Locational Purposes of Terrain  
 Information on Selected Sheets at 1:1,000,000 Scale, Confidential. Base  
 consists of composite of USAF Jet Navigation Charts 24 (Altai Range, C.)  
 and 37 (Brahmaputra River, U.), 1:2,000,000.

WEST CHINA

RELATIVE RELIABILITY FOR GENERAL LOCATIONAL PURPOSES

OF TERRAIN INFORMATION ON SELECTED MAP SHEETS AT 1:1,000,000 SCALE

1. Criteria of Comparison

The accompanying map overlay presents an evaluation of the depiction of physical features on map sheets covering part of West China. The evaluation is intended for users concerned with the reliability of local and regional topographic information. It is not intended for users who require definitive geodetic reliability or precise locations of surface features.

By the rigorous standards suitable for purposes of the latter type, less than 4 percent of the selected 1:1,000,000 coverage of the study area has been evaluated by the Army Map Service as being of "Fair" reliability (northeast corner of NI-48; eastern 20 percent of NH-48). For the less rigid requirements of this study, four categories of reliability -- Good, Fairly Good, Fair, and Poor -- are defined in the legend on the overlay. A theoretical fifth category, "Excellent," does not appear because its use is not justified.

2. Map Sheets Selected

Eleven of the twelve sheets evaluated are part of the International Map of the World (IMW) at the scale of 1:1,000,000. Each sheet covers an area measuring 6 degrees of longitude by 4 degrees of latitude and is subdivided into 1-degree squares. The north-south distance covered by each sheet is 276 statute miles (240 nautical miles), but the east-west distance varies. The east-west distance covered by sheets in the upper row (NJ) averages 330 statute miles; by those in the middle row (NI), approximately 350 miles;

and by those in the lower row (NH), approximately 360 miles. The eleven sheets are now issued as part of the AMS 1301 series, although 2 of them bear the obsolete imprint of the AMS 5301 series. There is no AMS sheet available in the IMW series for the area of NJ-48. Therefore, the USAF World Aeronautical Chart (WAC) 383, Alashan Mountains, has been used as the twelfth sheet in order to complete the coverage required for this study.

### 3. Base Map

The base map selected for this overlay is a composite of parts of two sheets, JN-24 and JN-37, of the U.S. Air Force series of Jet Navigation Charts. Charts of the JN series were selected because comparison with the IMW sheets is simplified by their convenient size and scale (approximately 1:2,000,000) and by the presence of a system of 1-degree grid squares. The topographic information on the JN charts is also a helpful supplement to that included on the IMW maps covering the eastern third of the study area.

The projection (Lambert Conformal Conic) used for the JN charts is one that preserves the proper proportions of each 1-degree square at the expense of maintaining a constant scale over the entire map. Scale distances therefore vary from north to south, but bearings and shapes of landforms are correct within each 1-degree square. These technical advantages, however, make it impossible to match exactly sections of two sheets along a given line. On the base map the portions of JN-24 and JN-37 that were used join precisely at only one point on the 96th meridian, which bisects the study area. East and west of this point the parallels of latitude diverge, thus creating on the base map a zone of duplication that has been indicated on the overlay by cross-hatching. Two graphic scales are included on the base map, one applicable to

the upper two tiers of sheets, the other to the lower one. The projection (Polyconic) used for the IMW sheets creates no such problems for the user.

#### 4. Control

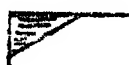
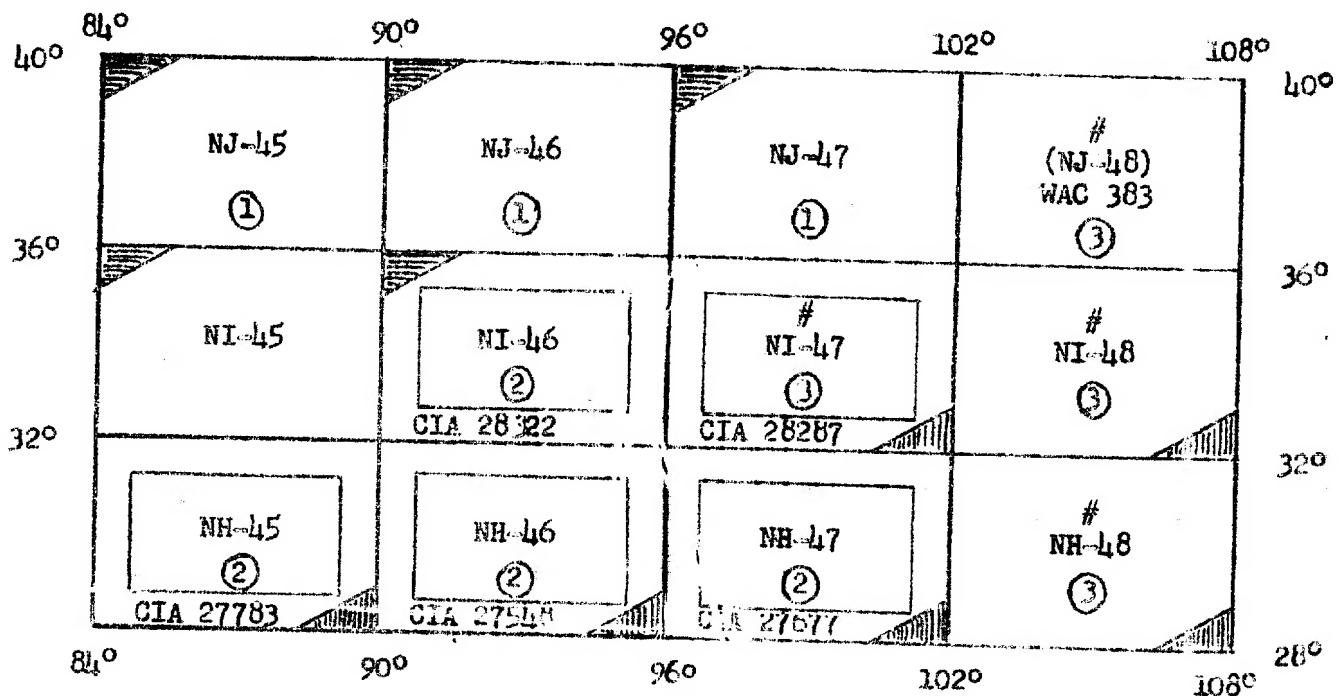
The problem of geodetic control adversely affects the reliability of all the map sheets under consideration. The longitude and latitude values of some explorers' traverses are not highly reliable. The locations of many features and the alignments of many route traverses may be in absolute error up to 15 miles or even more. The map sheets also include absolute errors in longitude that are due to faulty basic geodetic control used in map compilation. However, such errors in longitude and latitude do not matter a great deal as far as this study is concerned, since all but one of the sheets have been compiled on the same graticule system, thus perpetuating the same longitudinal error and making it a constant factor. On NJ-47, Ch'ing-hai, however, AMS has corrected the graticule by an adjustment of about 12 statute miles (20 kilometers) eastward. This change makes the features on the map appear to be the same distance (12 miles) farther west. The dashed outline of 1-degree squares shown on the overlay for this sheet is a crude depiction of this change in graticule, plotted with reference to the monastery in the middle of Koko Nor.

#### 5. Compilation Characteristics of Available AMS Editions (See Figure 1)

The eleven sheets of the AMS 1301 series are based on compilations from sources that are all more or less obsolete and inadequate. Four sheets (NI-45, NJ-45, NJ-46, and NJ-47) were recompiled by AMS between 1950 and 1953. These recompiled sheets are better than earlier ones because they add to the earlier (British) Survey of India compilations available information gained from a thorough exploitation of all explorations by European and American travelers.

Figure 1

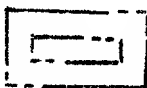
West China: Comparison of Selected IMW Sheets (AMS 1301 Series)



Compiled recently by Army Map Service



Compiled by (British) Survey of India



Reissued recently by CIA with corrections of alignments of major routes

Complete compilation or recompilation is needed

①

Chinese Nationalist 1:1 million sheet covering same area has some additional usefulness for sociological information or place names

②

Chinese Nationalist 1:1 million sheet covering same area has considerable additional usefulness, especially for place names

③

Chinese Nationalist 1:1 million sheet covering same area has Great additional usefulness, for physical information as well as for place names and sociological information.

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The remaining seven sheets are (British) Survey of India compilations of World War II date or shortly thereafter. Five of them (NH-45, NH-46, NH-47, NI-46, and NI-47) have recently been reissued by the Cartography Division of CIA for limited distribution. They include somewhat more reliable road and settlement data than the earlier edition, and terrain shading has been added on all sheets except NI-46.\*

Obviously, no correction of cultural data -- roads, settlements, political boundaries, and the like -- can improve the locational reliability of the terrain base on which it is overprinted, and this is the inescapable limitation of the five sheets reissued by CIA. Except in the case of NI-47, however, available sources do not supply enough new information to justify systematic recompilation of topographic as well as other data.

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photography of 1955-56 provides a classified source of terrain information for some parts of ethnic Tibet, but it is spotty and difficult to exploit. It was used to a small extent in the CIA reissue of NI-47, Sources of the Huang Ho, to correct a serious error in the course of the Yellow River as given on the original sheet. Since this correction exposes the utter uselessness of the adjoining portion of NI-48, T'ien-shui, the user is referred to the base map (JN-24), which portrays topography in this vicinity as it is shown on sheets NI-47 and NI-48 of the Chinese Nationalist series at 1:1,000,000.

#### 6. Reliability of Source Materials

The small reliability diagrams that are printed on the sheets of the AMS 1301 series are helpful in a limited way but their usefulness varies from

\*Several other sheets west of 84° East have also been reissued. In addition to the five sheets here mentioned, NI-45 will be reissued in March 1960 as CIA 28446. Other sheets scheduled for reissue later in 1960 include NJ-47.

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sheet to sheet.

Certain features of the map sheets themselves are useful keys to locational accuracy, and they have been considered in evaluating the coverage of the study area. The hydrography pattern is one of the best of such keys. Explorers normally go to great pains to indicate whether their depictions of rivers and streams are based on first-hand observation or are more or less inferential. Therefore, the relative density and complexity of their mapping of hydrography is a very useful indication of the amount of reliable information they were able to get from personal observation. The accuracy of depiction of all terrain features can be no greater than the relative accuracy of the hydrography.

Map errors perpetuating the mistakes that creep into explorers' maps can seldom be identified, but some such hidden errors are presumed to exist on the sheets included in this study. In any event, the sweeping contour and the dashed stream line indicative of the explorer's or the cartographer's uncertainty regarding terrain and hydrography are a clear warning to the user that all locations in that area may be subject to question.

The reliability of elevations noted on a map can always be questioned if precise surveys have not been made. In the bleak western two-thirds of the area under consideration, however, the relative ease of making long line-of-sight observations in order to project elevations northward from well-surveyed Himalayan peaks has facilitated the securing of reasonably reliable elevations on the Tibetan Plateau. The elevations in the areas farther north are less reliable, and in the eastern third of the area the terrain impedes the making of good reconnaissance surveys. Throughout the area, elevations that are reliable within 500 or 600 feet of error are the best that the user should expect to find. The relative error in selected local areas may be much less, even though the absolute error is great.



Place names in these remote areas are a special problem. Both explorers and cartographers have an understandable tendency toward filling up vast open spaces on their maps with all the names they find in their source materials. The resulting confusion in this part of West China becomes further compounded when maps are studded with apparently authentic and definitely exotic place names that give no hint of (a) the distinction between the name of a tribe and its campground, which may be nameless; or (b) the distinction between specific names of more or less permanence and generic terms used to describe physical features. The ignorance of guides and native informants and the transformations that sounds undergo in the course of being interpreted one or more times before they are set down in writing also add to the general confusion. Only in the occupied areas are place names normally permanent; elsewhere they are suspect. Of all classes of names, those attached to rivers and streams are probably the most enduring and reliable. Names of peaks and mountains are more vague in definition because an observer's concept of a mountain or mountain range may change according to the intervening distance. Even the names of occupied places may change with a change of occupants, their way of life, or type of government.

Compilation sources provided by records of explorations understandably vary greatly in value in direct relation to the experiences of the explorer. In the past, perhaps more than today, successful exploration has required not only courage, stamina, intellect, and character but also vast experience and good luck. Some expeditions were definitely ill-starred, and through necessity the mapping along many difficult traverses came to be of minor importance in relation to the immediate problems of survival.

Sven Hedin and Wilhelm Filchner probably made the greatest individual contributions to knowledge of the southern and eastern parts of the study area, and Hedin and Sir (Mark) Aurel Stein to information on the northern parts. As a group, the explorers associated with the (British) Survey of India made the greatest contribution, and it was they who set up the geodetic control net into which later traverses could be tied. Unfortunately, the (British) Survey of India compilations for the seven sheets evaluated do not carry the names of explorers nor the dates of their traverses, as do the four AMS recom compilations.

The "roads" and "trails" that crisscross the maps of the study area are in most cases, though not all, the routes followed by the explorers. In using maps of this area these routes should be relied on only to the extent that major landmarks such as peaks, passes, ferry crossings, and occupied places occur along the indicated road or trail with enough frequency and definiteness to establish the existence of a regular route.

The part of the study area that lies east of the 100th meridian is the most poorly mapped. Factors that have contributed to the inadequacy of mapping in this area include the more deeply dissected nature of the terrain, the sporadic distribution of population, and the slight strategic importance of this part of West China. Thus an anomaly has developed in which the regions on the western fringe of China Proper are more poorly mapped than the remoter areas still farther west.

#### 7. Additional Maps for Reference

Users with even a scanty knowledge of Chinese characters will find Chinese maps a helpful reference for the area. The 1:1 million scale Chinese Nationalist series of military maps, compiled in the early 1940's and known

collectively as the China Atlas, 1:1,000,000 (China, Bureau of Survey, Ministry of National Defense) vary in quality from area to area, but are likely to prove valuable for the eastern third of the study area. They are especially useful for the area of NJ-48, for which no sheet in the AMS 1301 series is available and WAC 383 sheet provides highly inadequate coverage.

Two recent Chinese Communist sources include small-scale maps that may be useful for hydrographic and road information, but their usefulness in connection with this study is limited by the fact that some are at scales as small as 1:7,500,000. The Physical Map of China at the scale of 1:4,000,000, published in Peking in 1958, has been reprinted as CIA 27228. The Atlas of the PRC, published in Peking in 1957, has been photostated and is available on loan from the CIA Map Library. This atlas is the most comprehensive set of modern Communist maps that has yet become available.

#### 8. Comments on Individual Map Sheets

NH-45 Tsangpo  
NH-46 Lhasa  
NH-47 Upper Mekong

The areas on these three sheets that are evaluated as "Good" on the overlay are described on the reliability diagrams\* of the parent (British) Survey of India maps as covered by "rigorous survey" between 1921 and 1940 for the Tsangpo sheet, and between 1910 and 1926 for the Lhasa and Upper Mekong sheets. The reliability diagrams also distinguish between "reconnaissance survey" (NI-45 only), "exploratory surveys," and "travellers and route reports," apparently in descending order of reliability. Using the criteria established for the overlay, some of the "travellers and route reports," deserve upgrading, notably those of the Lhasa area, and so have been characterized as "fairly

\*Reliability diagrams are not included on the sheets reissued by CIA.

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good." Therefore, the overlay does not agree entirely with the reliability diagrams on the maps themselves. On the CIA versions of these sheets the transportation data have been revised to show new highways and roads built by the Chinese Communists, and also changes in alignments of older routes. Some place names have been changed or added, especially in the vicinity of Lhasa.

NH-48 Ch'ung-ch'ing (Chungking)

This map sheet is in a class by itself. The portrayal of the data is not basically unreliable, but the features are excessively generalized and vague for the scale of the map. The political data are inadequate in quantity. This sheet covers the most populous part of a province of more than 70,000,000 inhabitants, and yet it shows only a fraction of the information that it could contain. The AMS evaluation of this sheet is accepted, for both physical data and transportation, and is used on the overlay. Portions of the base map (JN 37) in the eastern two-thirds of the area covered are superior to the IMW series.

NI-45 Chikhitei Tsho

This sheet, one of the recent AMS compilations, indicates the actual routes taken by various explorers and the dates of their explorations. With this information the user can quickly identify the source documents, which are listed in an accompanying explanatory paragraph, and can amplify the information on the map with such additional observations as the explorer was able to record in textual form. Some areas shown on NI-45 as being above the snow line have unaccountably been misinterpreted as lakes, or vice versa, by the compilers of the JN base map. The features that were thus

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misidentified are marked by an "X" on the JN base.

NI-46 Eastern Tibet

The main routes to Lhasa from Tsinghai cross the area covered by this sheet and their surroundings are relatively well known. So bleak is the region, however, that most of the area away from the main routes is very sketchily known. The Chinese 1:1 million NI-46 sheet indicates in a diagrammatic way more variety in terrain rendering for the areas off the main caravan routes than is found on the IMW NI-46, but for the Chinese sheet an estimate of terrain reliability is impossible. The Chinese sheet also includes more information on tribal distribution, camp grounds, and more place names. New highway data and a few names of places along the main routes have been added to the CIA edition of this sheet.

NI-47 Sources of the Huang Ho

Although this sheet is one of the poorest of the lot, it shows the route to Yu-shu and the area near the headwaters of the Yellow River (called the Ma Chu on NI-47) in a manner that charitably can be described as "fairly good." The same cannot be said for the rest of the area; most of the eastern third of the sheet is virtually useless. On the CIA edition of this sheet the course of the Yellow River was corrected to conform to additional information from explorers' reports and 25X1A2d1 photography. In the process of correction, however, one useful traverse made by Wilhelm Filchner eastward from 100°30', which is found on the parent AMB sheet, had to be deleted because it was impossible to reconcile latitudinal discrepancies. In the eastern third of this sheet the given latitudes and longitudes for all features are open to question.

NI-48 T'ien-shui

Probably relative locations of all features are fairly reliable for the areas rated "Fair" on NI-48, but for the rest of the sheet they are much less reliable. The confusion that prevails in the western part seems to vary in proportion to the distance from heavily populated valleys and administrative centers. Most of the northwestern half of the area covered is drained by tributaries of the Yellow River, especially those which flow through either poorly drained grasslands or intricately dissected areas of a badlands type (loess and soft sedimentary rocks) -- terrain that makes movement and ground mapping difficult. In compiling the JN base map for this area the Air Force apparently used the Chinese 1:1 million sheet for the western portions, thus improving the reliability of the JN chart over that of the IMW sheet. Even on the JN chart, however, absolute locations are still doubtful. The evaluations of the T'ien-shui sheet on the overlay as "Fair" and "Poor" probably err on the side of generosity, especially in regard to road alignments. The sheet should be used, if possible, in conjunction with other maps.

NJ-45 Ch'ieh-mo (Charchan Bazar)  
NJ-46 Tsaidam

These two sheets cover vast unpopulated areas and include parts of the large and virtually unexplored Takla Makan and Tsaidam Deserts. In the Lop Nor region (at the north edge of NJ-45) the work of Sven Hedin and his Sino-Swedish Expedition and the work of Aurel Stein and his Indian colleagues must be treated now as only fairly reliable because several decades have elapsed since they prepared their maps of the changeable hydrography of that region. On higher ground little or no change in the physical surroundings is likely to have taken place, and for these areas the work of these expeditions is still valid.

NJ-47 Ch'ing Hai (Koko Nor)

The area covered by this sheet is physically complex. It includes parts of the Gobi Desert and the Kansu Corridor, the greater part of the several remote ranges called the Nan Shan, and the hilly region with local basins and pasturelands lying between the agricultural areas surrounding Hsi-ning and the arid and barren Tsaidam Basin. The Kansu Corridor and the area between the Tsaidam and Hsi-ning are relatively well mapped. The part of the Gobi Desert included within this sheet has been of very minor importance, and the reliability of its maps is currently of little concern. The Nan Shan, however, comprises about a third of the area covered by NJ-47, and here only the northern valleys have been explored with adequate attention to local detail. The Chinese 1:1 million map was used in the compilation of this sheet and need not be consulted further, except for the names of places, tribes, and clans.

WAC 383 Alashan Mountains

Sheet NJ-48, Lan-chow, has been published only in the Chinese 1:1 million edition. The highly inadequate WAC 383, Alashan Mountains, has been used to complete coverage of the study area because it is the most readily available English-language map of the area at 1:1,000,000. East of the line described by the 105th meridian and the course of the Yellow River, WAC 383 is probably more reliable than it is to the west of this line. The road network cannot be accepted as reliable.

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